

WHAT IS CLAIMED IS:

1. A method for detecting a forwarding problem within an autonomous system, the autonomous system having a plurality of nodes including a source node, an intermediate
5 node, and a destination node, the method comprising:

initiating a message from the source node, the message being arranged to be sent to a message destination that is an external address that is not an address located within the autonomous system;

forwarding the message from the source node along a path, the path being
10 arranged to pass from the source node to the external address via the intermediate node and the destination node;

receiving the message on the destination node, wherein a portion of the path between the source node and the destination node is a first path segment;

removing the message from the path at the destination node; and

15 initiating a response from the destination node, the response being arranged to be sent along the first path segment from the destination node to the source node, wherein the response is arranged to indicate that the intermediate node does not have a forwarding problem.

20 2. The method of claim 1 wherein the external address is substantially specified in the message as the message destination.

3. The method of claim 1 wherein the source node is a first edge node of the autonomous system and the destination node is a second edge node of the autonomous
25 system.

4. The method of claim 1 further including:

identifying the path;

determining a number of nodes through which the path segment passes between
30 the source node and the destination node; and

storing an indication in the message, the indication being arranged to indicate a number of nodes through which the path segment passes between the source node and the destination node.

- 5 5. The method of claim 4 wherein forwarding the message from the source node along a path includes receiving the message on a first node of the plurality of nodes, the first node being arranged to substantially alter the indication to indicate a number of nodes through which the path segment passes between the first node and the destination node.

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6. The method of claim 5 wherein when the message is received on the destination node, the destination node obtains the indication to determine whether to remove the message from the path.

7. The method of claim 1 wherein the path is a best path between the source node and the external address.

- 15 8. A method for detecting a forwarding problem within an autonomous system, the autonomous system having a plurality of nodes including a source node, an intermediate node, and a destination node, the method comprising:

20 initiating a message from the source node, the message being arranged to be sent to a message destination that is an external address that is not an address located within the autonomous system;

forwarding the message from the source node along a path, the path being arranged to pass from the source node to the external address via the intermediate node and the destination node;

determining whether a response to the message is received from the destination node; and

initiating a process to identify a source of the forwarding problem when it is determined that the response to the message is not received from the destination node.

9. The method of claim 8 wherein initiating the process to identify the source of the forwarding problem includes sending a new message from the source node to the intermediate node along the path, the new message being of substantially the same type as the message.

10. The method of claim 9 wherein the message is a traceroute message.

11. The method of claim 9 wherein the external address is substantially specified in the message as the message destination.

12. The method of claim 9 wherein the source node is a first edge node of the autonomous system and the destination node is a second edge node of the autonomous system.

13. The method of claim 9 further including:

identifying the path;

10 determining a number of nodes through which the path passes between the source node and the destination node; and

storing an indication in the message, the indication being arranged to indicate a number of nodes through which the path passes between the source node and the destination node.

15 14. A method for detecting a forwarding problem within an autonomous system, the autonomous system having a plurality of nodes including a source node, an intermediate node, and a destination node, the method comprising:

receiving a message on the destination node from the source node, wherein the message substantially originates at the source node and is intended to be sent through the destination node to a message destination that is an external address which is not an address located within the autonomous system, the message being received on the

destination node through a path segment between the source node and the destination node, the path segment being a part of an overall path between the source node and the message destination;

removing the message from the overall path at the destination node, wherein removing the message from the overall path at the destination node substantially prevents the message from reaching the message destination; and

initiating a response from the destination node, the response being arranged to be sent along the path segment from the destination node to the source node, wherein the response is arranged to indicate that the intermediate node does not have a forwarding problem.

15. The method of claim 14 wherein the external address is substantially specified in the message as the message destination.

16. The method of claim 14 wherein the source node is a first edge node of the autonomous system and the destination node is a second edge node of the autonomous system.

17. The method of claim 14 further including:

determining whether to remove the message from the overall path at the destination node, wherein the message is removed from the overall path at the destination node if it is determined that the message is to be removed from the overall path.

18. The method of claim 17 wherein an indication of whether the destination node is to remove the message from the overall path is stored in the message, and determining whether to remove the message from the overall path at the destination node includes obtaining the indication.

19. A network element suitable for use in an autonomous system of an optical network, the autonomous system having a plurality of network elements including an intermediate node and a destination node, the network element comprising:

code devices arranged to initiate a message, the message being arranged to be sent
5 to a message destination that is an external address that is not an address located within the autonomous system;

code devices arranged to forward the message along a path, the path being arranged to pass from the network element to the external address via the intermediate node and the destination node;

code devices arranged to determine whether a response to the message is received from the destination node;

code devices arranged to initiate a process to identify a source of the forwarding problem when it is determined that the response to the message is not received from the destination node; and

a memory arranged to store the code devices.

20. The network element of claim 19 wherein the code devices arranged to initiate the process to identify the source of the forwarding problem include code devices arranged to send a new message to the intermediate node along the path, the new message being of substantially the same type as the message.

21. The network element of claim 20 wherein the message is a traceroute message.

10 22. The network of claim 19 wherein the external address is substantially specified in the message as the message destination.

23. The network of claim 19 wherein the network element is a first edge node of the autonomous system and the destination node is a second edge node of the autonomous
15 system.

24. The network element of claim 19 further including:

code devices arranged to identify the path;

code devices arranged to determine a number of nodes through which the path passes between the source node and the destination node; and

5 code devices arranged to store an indication in the message, the indication being arranged to indicate a number of nodes through which the path passes between the source node and the destination node.

25. A network element suitable for use in an autonomous system of an optical network, the autonomous system having a plurality of network elements including an

10 intermediate node and a source node, the network element comprising:

code devices arranged to receive a message from the source node, wherein the message substantially originates at the source node and is intended to be sent to the message destination that is an external address which is not an address located within the autonomous system, the message being received through a path segment between the source node and the network element, the path segment being a part of an overall path between the source node and the message destination;

code devices arranged to remove the message from the overall path, wherein the code devices arranged to remove the message from the overall path substantially prevent the message from reaching the message destination;

15 code devices arranged to initiate a response, the response being arranged to be sent along the path segment to the source node, wherein the response is arranged to indicate that the intermediate node does not have a forwarding problem; and

a memory that stores the code devices.

26. The network element of claim 25 wherein the external address is substantially

20 specified in the message as the message destination.

27. The network element of claim 25 wherein the source node is a first edge node of the autonomous system and the network element is a second edge node of the autonomous system.

5 28. The network element of claim 25 further including:
code devices arranged to determine whether to remove the message from the overall path at the destination node, wherein the message is removed from the overall path at the destination node if it is determined that the message is to be removed from the overall path.

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29. The network element of claim 28 wherein an indication of whether the destination node is to remove the message from the overall path is stored in the message, and the code devices arranged to determine whether to remove the message from the overall path at the destination node include code devices arranged to obtain the indication.

15 30. A network element suitable for use in an autonomous system of an optical network, the autonomous system having a plurality of network elements including an intermediate node and a destination node, the network element comprising:

means for initiating a message, the message being arranged to be sent to a message destination that is an external address that is not an address located within the
20 autonomous system;

means for forwarding the message along a path, the path being arranged to pass from the source node to the external address via the intermediate node and the destination node;

means for determining whether a response to the message is received from the destination node; and

means for initiating a process to identify a source of the forwarding problem when it is determined that the response to the message is not received from the destination node.

25. A network element suitable for use in an autonomous system of an optical network, the autonomous system having a plurality of network elements including an intermediate node and a source node, the network element comprising:

means for receiving a message from the source node, wherein the message substantially originates at the source node and is intended to be sent through the destination node to a message destination that is an external address which is not an address located within the autonomous system, the message being received on the destination node through a path segment between the source node and the network element, the path segment being a part of an overall path between the source node and the message destination;

5 means for removing the message from the overall path, wherein removing the message from the overall path substantially prevents the message from reaching the message destination; and

means for initiating a response, the response being arranged to be sent along the path segment to the source node, wherein the response is arranged to indicate that the intermediate node does not have a forwarding problem.